

- 1 -

Description

The present invention has as its object a rotary connector adapted to be used for alternately transferring a fluid at ambient temperature and another fluid at low temperature, for example light petrols or naphtha at ambient temperature and liquefied methane at low temperature.

So-called cryogenic connectors having two sealing levels or means (primary and secondary) are known, which are disposed in particular on arms for loading and unloading liquefied products at low temperature. These sealing means generally have a U-shaped cross-section.

From GB-A-942,777 a rotary connector of the cryogenic type is known which corresponds to the preamble of Claim 1. The primary sealing means (20 - 30) is mounted on springs so as to be applied constantly against the connector member. The secondary sealing means, which may in particular be made of "Teflon", is compressed in the gap between a flange and the connector member.

From US-A-3,301,568 a rotary connector of the cryogenic type is known, in which a single seal is expansible in an annular chamber under the action of a spring. The casing of the seal is made of non-elastic "Teflon" and contains a steel ring provided with fingers.

The aim of the invention is to ensure that products which are liquid at ambient temperature and

- 2 -

become solid at low temperature will not come into contact with the generally U-shaped seals provided for low-temperature operation. If these products were to remain captive in these U-shaped seals, they would be detrimental to tightness on solidifying at low temperature. On the other hand, at low temperature, with the additional seal put out of action, the connector is under exactly the same working conditions as those usually provided for low-temperature operation. The aim sought by the invention, as characterised in Claim 1, is achieved. Particular embodiments of the invention appear in the dependent claims.

Other characteristics and advantages of the present invention will emerge from the following description, which is given with reference to the accompanying drawings, in which:

Figure 1 is a view in section of a portion of a rotary connector according to the invention;

Figure 2 shows an exploded view in perspective of two elements of this connector;

Figure 3 is a view, likewise in section, of a more fragmentary portion of a modified form of connector according to the invention;

Figure 4 is a view in perspective, on a smaller scale, of an element of the connector shown in Figure 3, and

Figure 5 is a view in section, comparable with that in Figure 1, of another modified embodiment.

In the embodiments illustrated, the rotary

- 3 -

connector according to the invention comprises three parts (A), (B), and (C), and has the two U-shaped sealing levels (d) and (e) of the so-called cryogenic connectors.

An additional sealing level is provided by a fixed seal (1), preferably of elastomer material, disposed in a groove (2) formed in the part (A).

In the embodiment illustrated in Figures 1 and 2, a seal support surface (3), facing the seal 1, is formed on an annular member (4) adapted to slide in the direction of the double arrow f1 in an annular step (5) formed in the part (B) of the connector and open towards the interior of the part (B).

Springs (6) disposed in bores (5A) support the seal support surface (3) of the annular part (4) on the seal (1) when the connector is at ambient temperature.

Rods (7) of a material having a high coefficient of thermal expansion, for example of a tetrafluoroethylene polymerisation product known under the trade mark "Teflon", are provided for retraction when the temperature falls and are connected to the annular part (4). The connection is made by holding a head (7A) of each rod in a corresponding bore formed in the annular part, with the aid of a clip (7B).

By retracting when the temperature falls, the rods (7) displace the annular part (4), and therefore also the seal support surface (3), towards the part (B) and thus release the seal (1), which starting from

- 4 -

a certain temperature is no longer compressed. This is made necessary by the fact that the elastomer seal becomes fragile at low temperature and would be damaged if it were subjected to mechanical loads tending to deform it at these low temperatures.

In order to increase the deformation of the device putting out of action the additional seal between the two temperatures at which it has to operate, it is possible to increase the length of the rods of material having a high coefficient of expansion by providing a coiled portion of these rods, which is deformed to a greater or lesser extent depending on the temperature, the deformation being transmitted to the remainder of the rod.

In the embodiment illustrated in Figures 3 and 4, the coiled portion (8) of each rod is wound around a common ring (9).

In yet another modified embodiment (Figure 5), instead of the assembly comprising rods and the annular part with springs it is possible to use a cylinder of a material having a high coefficient of expansion. This material may here again be "Teflon".

This cylinder (10) is provided with an entablature (11) equipped with the seal support surface (3) and adapted to slide in an internal annular step (12) formed in the part (B), springs (13) being interposed between the entablature (11) and the step (12).

In all the embodiments described above a seal (14) is disposed in a groove (15) either in the

- 5 -

part (4) or in the entablature (11), in such a manner that the seal can bear against the part (B).

In the embodiments shown in Figures 1, 2 and 5 the rods (7) or the cylinder (10) are retained at their end opposite the annular part (4) or the entablature (11) by a screw or screws (16).

In the version using rods shown in Figure 1, this screw (16) passes through the part (B) of the connector and extends to the rod (7) housed in a channel (17) extending the bore (5A).

The sealing means in the presence of the low-temperature fluid may obviously comprise only a single level of tightness, if this is thought sufficient, instead of two levels, primary and secondary, (d) and (e) of the so-called cryogenic connectors.

Finally, it is obvious that the present invention has been described and illustrated only by way of preferred example, and that it will be possible to apply equivalent means in its component elements without thereby departing from the scope of the invention, as defined in the following claims.

**Revendications (as printed)**

1. Raccord tournant du type à étanchéité cryogénique pour le transfert de produits fluides permettant, alternativement, le transfert de produits à basse température et le transfert de produits à température ambiante, comprenant au moins un moyen d'étanchéité cryogénique primaire (d) et secondaire (e), caractérisé en ce que: le raccord comprend un moyen supplémentaire d'étanchéité constitué d'une part, par un joint fixe (1) disposé sur l'une des pièces (A) du raccord et de l'autre part, pour une pièce annulaire d'appui-joint (4) ledit moyen supplémentaire d'étanchéité (1, 4) présente deux états d'utilisation: un état d'utilisation à température ambiante et un état d'utilisation à basse température, le raccord comprend un dispositif (7; 10) sensible au gradient thermique entre les deux états d'utilisation, réalisé en un matériau à haut coefficient de dilatation thermique et se déformant longitudinalement, ledit dispositif mettant hors service ledit moyen supplémentaire d'étanchéité (1, 4) pour une utilisation à basse température et le mettant en service pour une utilisation à température ambiante.

2. Raccord tournant selon la revendication 1, caractérisé en ce que le dispositif sensible au gradient thermique est constitué par une série de tiges déformables (7), du fait du gradient thermique, ledit dispositif agissant sur un moyen intermédiaire constitué par la pièce annulaire d'appui-joint (4) montée ressorts (6) et reliée aux tiges déformables (7).

3. Raccord tournant selon la revendication 2, caractérisé en ce que les tiges déformables (7) sont prolongées par une portion enroulée (8) de celles-ci.

4. Raccord tournant selon la revendication 1 caractérisé en ce que le dispositif sensible au gradient thermique est constitué par un seul et même cylindre en un matériau à haut coefficient de dilatation thermique.

5. Raccord tournant selon la revendication 4, caractérisé en ce que le cylindre présente un entablement (11) monté sur ressorts (13).

6. Raccord tournant selon l'une quelconque des revendications 1 à 5, caractérisé en ce que le dispositif sensible au gradient thermique (7 ou 10) est, à la manière connue, un produit de polymérisation du tétrafluoro-éthylène connu sous la marque "Téflon".

7. Raccord tournant selon l'une quelconque des revendications 1 à 6, caractérisé en ce que ledit moyen d'étanchéité cryogénique comporte les deux moyens primaire (d) et secondaire (e).

**Patentansprüche (as printed)**

1. Drehverbindung der bei Tiefsttemperaturen abdichtenden Art für die Übertragung von Fluid-Produkten, die alternativ die Übertragung von Produkten bei tiefster Temperatur und die Übertragung von Produkten bei Umgebungstemperatur zuläßt, mit mindestens einem primären Tiefsttemperatur-Dichtmittel (d) und einem sekundären Tiefsttemperatur-Dichtmittel (e), dadurch gekennzeichnet, daß die Verbindung ein zusätzliches Dichtmittel enthält, das einesteiis durch eine festliegende Verbindung (1) gebildet ist, die in einem der Teile (A) der Verbindung angeordnet ist, und andererseits durch ein ringförmiges Stützverbindungsteil (4) mit zwei Gebrauchszuständen: einem Gebrauchszustand des zusätzlichen Dichtmittels (1, 4) bei Umgebungstemperatur und einem Gebrauchszustand bei tiefer Temperatur, daß die Drehverbindung eine auf den Temperaturgradienten zwischen den zwei Gebrauchszuständen reagierende Einrichtung (7; 10) enthält, die durch ein Material mit hohem thermischen Ausdehnungskoeffizienten realisiert ist und sich in Längsrichtung verformt, wobei diese Einrichtung außer Funktion mit dem zusätzlichen Dichtmittel (1, 4) bei einer Verwendung bei tiefer Temperatur und in Funktion bei einer Verwendung bei Umgebungstemperatur ist.

2. Drehverbindung nach Anspruch 1, dadurch gekennzeichnet, daß die auf den Temperaturgradienten reagierende Einrichtung durch eine Reihe von durch den Temperaturgradienten verformbaren Stiften (7) gebildet wird, wobei die Einrichtung über ein Zwischenmittel wirkt, das durch das Ringstützteil (4) gebildet wird, das auf Federn (6) befestigt ist und sich auf den verformbaren Stiften (7) abstützt.

3. Drehverbindung nach Anspruch 2, dadurch gekennzeichnet, daß die verformbaren Stifte (7)

durch einen eingerollten Abschnitt (8) derselben verlängert sind.

4. Drehverbindung nach Anspruch 1, dadurch gekennzeichnet, daß die auf den Temperaturgradienten reagierende Einrichtung durch ein und denselben Zylinder aus einem Material mit hohem thermischen Ausdehnungskoeffizient gebildet ist.

5. Drehverbindung nach Anspruch 4, dadurch gekennzeichnet, daß der Zylinder einen auf Federn (13) angebrachten verbreiterten Rand (11) aufweist.

6. Drehverbindung nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß die auf den Temperaturgradienten reagierende Einrichtung (7; 10) in an sich bekannter Weise aus einem unter der Marke "Teflon" bekannten Polymerisationsprodukt von Tetrafluor-Ethylen gebildet ist.

7. Drehverbindung nach einem der Ansprüche 1 bis 6, dadurch gekennzeichnet, daß das Tiefsttemperatur-Dichtmittel die beiden primären (d) und sekundären (e) Mittel umfaßt.

**Claims (as printed)**

1. A rotary connector of the cryogenic tightness type for transfer of fluid products to permit alternately transfer of low temperature products and transfer of ambient temperature products, comprising at least one primary (d) and secondary (e) cryogenic tightness means, characterized in that the connector comprises a supplementary tightness means consisting of a fixed seal (1) disposed on one of the parts (A) of the connector, on the one hand, and on the other hand, of an annular supporting sealing part (4), said supplementary tightness means (1, 4) presents two states of use: one state of use at the ambient temperature and another state of use at low temperature, the connector comprises a device (7, 10) responsive to the thermal gradient between the two states of use, realized from a high thermal dilation coefficient material and deforming longitudinally, said device causing said supplementary tightness means (1, 4) to be inoperative for a low temperature use and to be operative for an ambient temperature use.

2. A rotary connector according to claim 1, characterized in that the thermal gradient responsive device consists of a series of rods (7), deformable due to the thermal gradient, said device acting upon intermediary means consisting of the annular supporting seal (4) mounted on springs (6) and connected to the deformable rods (7).

3. A rotary connector according to claim 2, characterized in that the deformable rods (7) are extended by a coiled portion (8) thereof.

4. A rotary connector according to claim 1, characterized in that the thermal gradient responsive device consists of one and the same cylinder of a material of high thermal dilation coefficient.

5. A rotary connector according to claim 4, characterized in that the cylinder presents an entablature (11) mounted on springs (13).

6. A rotary connector according to any one of claims 1 to 5, characterized in that the thermal gradient responsive device (7 or 10) is in a known manner a polymerization product of tetrafluoroethylene known under the trade mark "Teflon".

7. A rotary connector according to any one of claims 1 to 6, characterized in that said cryogenic tightness means comprises both primary (d) and secondary (e) means.